End of Year Report
2004

Klamath Fish Health Assessment Team (KFHAT)

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Summary

The Klamath Fish Health Assessment Team (KFHAT) is a technical workgroup that formed during the summer of 2003 with the purpose of providing early warning and a coordinated response effort to avert, or respond to a non-hazardous materials related fish kill event such as occurred in the Fall of 2002. To accomplish this goal, KFHAT created a network through which information about current river and fish health conditions in the Klamath Basin can be quickly shared among participants, the general public, and resource managers. The timely dissemination of information on river conditions from a technical workgroup such as KFHAT to resource managers and other policy makers is imperative for rapid and well-informed decision making. In addition to information sharing and coordinating response efforts, KFHAT members are attempting to better understand the specific conditions and warning signs which may lead to a fish kill in the Klamath Basin.

During 2004 KFHAT members:

- participated in monthly coordination meetings
- held a public meeting to disseminate information about KFHAT's role and activities in the Klamath Basin
- developed the Klamath River Fish Mortality Response Plan (Draft)
- conducted a training exercise to test the functionality of the Response Plan
- created the web based Klamath Fishery Portal for information sharing
- conducted numerous sampling and survey events throughout the Klamath Basin.

This report summarizes KFHAT activities during 2004, and includes a summary of fishery and water quality and quantity information. The large network of juvenile traps operated in the spring 2004 alerted KFHAT members to the severity of disease conditions, which may have gone largely undetected if this unprecedented array of traps had not been operated. This reflects the importance of maintaining or expanding various data collection efforts in the Klamath Basin that may capture information useful for supporting defensible, protective, and fair decisions about resource management in the Klamath Basin.

In the near future, KFHAT will continue to provide an early warning and a coordinated response effort to avoid, or at least respond to, possible fish kills with the information that is available in the Basin. Ongoing funding sources are needed to support this crucial effort.

I. Who is KFHAT?

-Contributed by Katharine Spivak, NCRWQCB

Introduction

The Klamath Fish Health Assessment Team (KFHAT) is a technical workgroup which formed during the summer of 2003 with the purpose of providing early warning and a coordinated response effort to avert, or respond to a non-hazardous materials related fish kill event such as occurred in the Fall of 2002. To accomplish this goal, KFHAT created a network through which information about current river and fish health conditions in the Klamath Basin can be quickly shared among participants, the general public, and resource managers. The timely dissemination of information on river conditions from a technical workgroup such as KFHAT to resource managers and other policy makers is imperative for rapid and well-informed decision making. In addition to information sharing and coordinating response efforts, KFHAT members are attempting to better understand the specific conditions and warning signs which may lead to a fish kill in the Klamath Basin.

Participants

KFHAT was initiated by the North Coast Regional Water Quality Control Board and is made up of agencies, tribes, private organizations, and other interested individuals that share a concern for fish health in the anadromous portions of the Klamath Basin. Attendees in 2004 have included representatives of the following:

- California Department of Fish and Game
- Hoopa Valley Tribe
- Humboldt Watershed Council
- Karuk Tribe
- Klamath Salmon Anglers and Guides Association
- National Oceanic and Atmospheric Administration Fisheries (National Marine Fisheries Service)
- North Coast Regional Water Quality Control Board
- PacifiCorp
- Quartz Valley Tribe
- Salmon River Restoration Council
- U.S. Bureau of Reclamation
- U.S. Coast Guard
- U.S. Environmental Protection Agency
- U.S. Geological Survey
- U.S. Fish and Wildlife Service
- U.S. Forest Service
- Yurok Tribe

Overview of 2004

During 2004, KFHAT members participated in monthly coordination meetings, held a public meeting, developed the Klamath River Fish Mortality Response Plan (Draft), created the web based Klamath Fishery Portal for information sharing, and conducted numerous sampling and survey events throughout the Klamath Basin. This report summarizes KFHAT activities during 2004, and includes a summary of fishery and water quality and quantity information. The final section in this document discusses resource needs, and details how funding for data collection in the Klamath Basin and for KFHAT is imperative to further the ability to anticipate, avert, and respond to future fish kills in a coordinated manner.

II. Information Sharing, Outreach, and Coordination

-Contributed by Katharine Spivak, NCRWQCB

Klamath Fishery Portal

The web based Klamath Fishery Portal (portal) is a central repository for all of the information related to current projects KFHAT members are working on. In early 2004 the California Department of Fish and Game (CDFG) released a pilot version of the portal, and by mid-2004 the portal was fully functional and accessible on the Internet. The portal has expedited the process of data and information sharing among KFHAT members and the general public. KFHAT members

have the ability to log onto the portal and access a members-only page on which there is a bulletin board/chat forum, draft work products, and documents for members' viewing. The general public can access information on current river conditions as well as fisheries and water quality documents. The portal also contains contact information for key KFHAT members, and links to other useful sites in the Klamath Basin. The Klamath Fishery Portal can be accessed at: <http://ncncr-isb.dfg.ca.gov/KFP/DesktopDefault.aspx>. For more information on the Klamath Fishery Portal please contact, Sara Borok of the CDFG at (707) 822-0330, or <sborok@dfg.ca.gov>.

Public Meeting

On August 19, 2004, KFHAT held a public meeting at the Yurok tribal office in Klamath. Together, members of KFHAT discussed the role of KFHAT in the Klamath Basin. Presentations were made about fish disease studies, fish reconnaissance surveys, and preliminary results were discussed. The factors that contributed to the 2002 kill were discussed and compared to 2004 conditions, and the Klamath River Fish Mortality Response Plan (Draft) was introduced. KFHAT asked for assistance from the public in reporting observations of numerous sick or dead fish to CalTIP and handed out flyers with information on the subject. Members of KFHAT addressed the comments, concerns, and frustrations of those who attended the meeting.

The meeting reflected the coordinated approach of the diverse participants of KFHAT and solidified its presence as an active group in the Klamath Basin formed to evaluate and address the conditions that may lead to a fish kill. Additionally, the meeting reflected that KFHAT is a technical work group concerned with protecting fish populations in the Klamath Basin, and not a group of policy makers.

Klamath River Fish Mortality Response Plan

To organize the response to a potential or actual fish kill in the Klamath Basin, KFHAT has created the Klamath River Fish Mortality Response Plan (Draft) (Response Plan). KFHAT members can be mobilized in a timely manner to evaluate fish health, mortality, and associated causes throughout the Klamath River mainstem and tributaries. The Response Plan aims to:

1. Serve as an initial guide for response to non-hazardous materials related fish kill events
2. Identify participants of the Fish Kill Response and Monitoring Network (FKRMN) and lead agency responsibilities
3. Provide guidelines for documenting the magnitude and extent of the event
4. Provide guidelines for data responsibilities and post-event analysis and reporting
5. Give direction to FKRMN to identify potential mitigation efforts to stop or reduce a fish kill utilizing existing agency infrastructure and responsibilities
6. Reflect that KFHAT will work to develop recommendations to prevent Klamath Basin fish kills from occurring, using a growing body of data, empirical information, and available literature.

Monitoring information from KFHAT participants and others throughout the Klamath Basin serves as useful warning indicators of deteriorating conditions and increased risk of a fish kill. KFHAT developed a four level system of readiness, presented in the Response Plan, to describe the current conditions and alert level in the Basin.

1. **Green**
    - River conditions appear satisfactory, fish appear healthy, no immediate problems foreseen

- Frequent data sharing is not as crucial at this level, but continue to observe and document conditions

2. **Yellow**
   - Conditions suggest the need for heightened awareness, such as observations of increased fish morbidity or mortality
   - Data sharing among KFHAT and resource managers becomes important on a frequent basis, using email and phone contacts
   - The fish mortality response plan procedures should be reviewed and responders should be ready to take action if the situation escalates
3. **Orange**
   - A fish kill is imminent and management levels in agencies need to be alerted
   - KFHAT provides recommendations to management with basis for recommendations
4. **Red**
   - A fish kill is occurring or expected
   - Frequent data sharing is crucial and relies on quick and accurate information exchange by phone with follow-up documentation
   - The fish mortality response plan is fully implemented
   - Immediate management actions may be needed to avoid further mortality.

In the Response Plan, a fish kill is defined as any event involving fish mortality above background levels. Fish mortality events in the Klamath Basin can be highly variable in intensity, geographic scale, and cause. As such, the Response Plan is intended to serve as a general guide to a process and does not contain exhaustive specifics on sampling techniques and protocol. Instead, the Response Plan refers to initiating reconnaissance-level team discussions that must occur to finalize procedures prior to full deployment to the field and identifies, by geographic area, lead agencies responsible for coordinating fish kill response. The issue of safety and the procedure for responding to hazardous spills and non-hazardous spills are also covered in the Response Plan, as are data responsibilities and post-event reporting. In the event of a fish kill, a phone tree has been developed in the Response Plan, which allows for the rapid notification of responders.

The September 28, 2004 version of the Klamath River Fish Mortality Response Plan (Draft) can be accessed online via the Klamath Fishery Portal at: <http://ncncr-isb.dfg.ca.gov/KFP/DesktopDefault.aspx>. The Response Plan will be finalized during the upcoming year.

Training Exercise

To determine whether the phone tree and Response Plan would function as desired in the event of a fish kill, KFHAT conducted a training exercise involving a juvenile salmonid fish kill scenario. On May 11, 2004 a phone call was initiated by one of the KFHAT members, selected at random, and the following fish mortality scenario was relayed as designated by the phone tree:

> Scenario:
> It's mid-June, air temperatures are in the 90's (F), and water temperatures are in the 20's (C). There has been no rain for a month and the snow pack is gone. There was no funding for the yearling program at Iron Gate Hatchery, and millions of young-of-the-year fish have been from the hatchery. Releases from Iron Gate Dam are 600 to 700 cfs. Dead juvenile fish are appearing in screw traps in the Happy Camp area.

Scene:
CDFG receives a call from concerned citizens that dead fish are seen in the bottoms of pools at the mouths of tributaries.

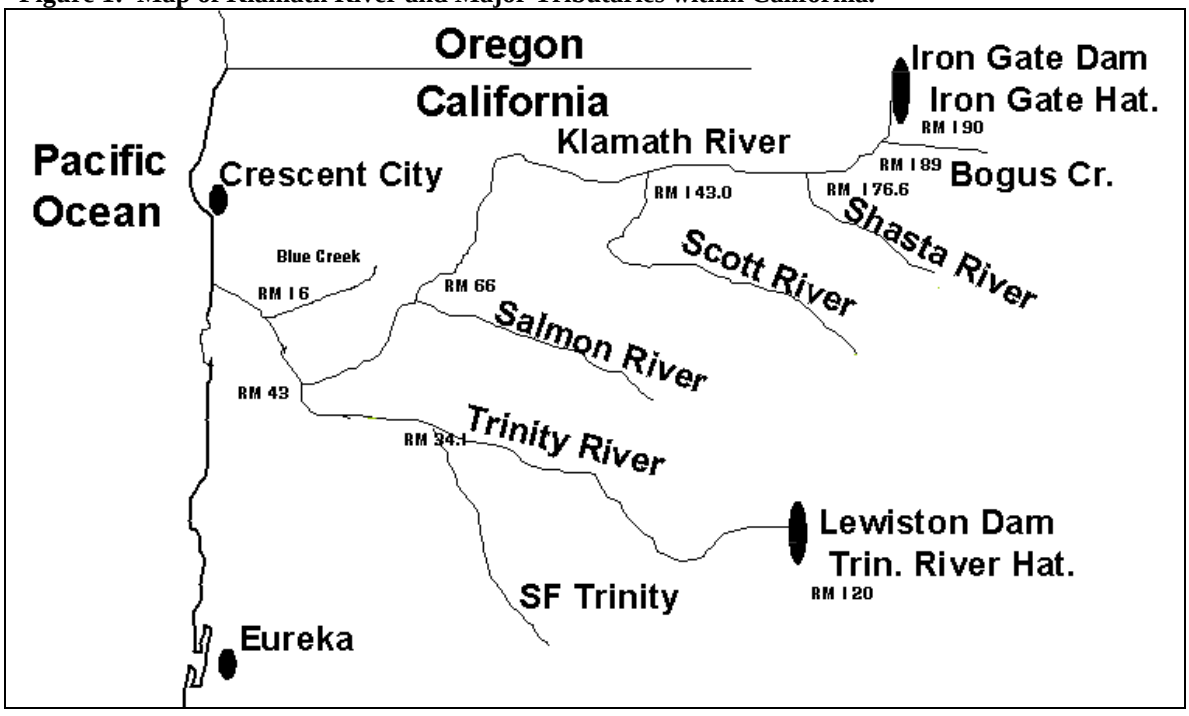
No vehicles have been seen overturned, no meth labs have been discovered in the area, no diesel leaks have been reported, no pesticide spills have been noted. There is no reason to suspect the mortality is resulting from a chemical discharge.

Responders were asked to report to the U.S. Forest Service (USFS) offices in Happy Camp at 11:00 a.m. the following day, May 12, 2004. Once all the responders had arrived KFHAT members walked through the plan, identifying the various teams that would be needed and how they would function. The scenario was reviewed and KFHAT members suggested ways to improve execution of the Response Plan, discussed areas of the plan that were deficient, and shared ideas about improving the plan. The Response plan has been revised based on these findings and suggestions from the training exercise.

III. Klamath Basin Field Studies and Data Collection

The following sections were contributed by various KFHAT participants and discuss field studies and data collection efforts members of KFHAT have conducted and participated in during 2004. This is not an exhaustive account of all monitoring efforts conducted by KFHAT members, but is a good representation of the type of work being performed in the Basin. The map below lists river miles for the major tributaries and dams in the Klamath Basin (Figure 1).

Figure 1: Map of Klamath River and Major Tributaries within California.



Juvenile Salmonids

-Contributed by Charlie Chamberlain, USFWS

In 2004, an unprecedented array of Klamath River and tributary juvenile emigration traps were operated as a result of multiple concurrent and independent studies (Table 1). Pieces of this

network were funded by different entities (Klamath River Basin Fisheries Task Force, U.S. Bureau of Reclamation (USBOR), U.S. Fish and Wildlife Service (USFWS), U.S. Geological Survey (USGS), National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries), CDFG) and for different purposes (explore effects of Iron Gate Dam operation on coho salmon, calibration of Chinook fry variables for a salmon production model, quantify steelhead emigration from Shasta River, quantify salmonid emigration from the Salmon River, etc). The traps were operated over varying periods to suit the needs of their respective studies. Operators included the USFWS, CDFG, Yurok Tribal Fisheries Program, Karuk Tribe Department of Natural Resources, and the Salmon River Restoration Council (SRRC).

Observation of sick and dead juvenile salmonids from various locations within this network of traps alerted KFHAT participants to high incidences of disease-symptomatic fish, especially among Chinook salmon juveniles and at mainstem sites not typically trapped before 2004. The severity of disease conditions may have gone largely undetected if this unprecedented array of traps had not been operated in spring of 2004.

Table 1: 2004 Klamath River juvenile trapping network.

Mainstem Location	River mile	Tributary mile	Trap Type	Start Date	Pull Date
Downstream of Bogus Creek	189		Frame Rotary	10-Mar 10-Mar	13-May 05-May
Carson Creek (I-5)	180		Frame Rotary	11-Mar 10-Mar	06-May 21-Apr
Kinsman Creek	146		Frame Rotary	10-Mar 10-Mar	28-Jun 03-Jul
Bulk Plant (Happy Camp)	108		Frame Rotary	30-Mar 05-Mar	09-Jul 14-Jun
Persido Bar	81		Frame Rotary	07-Mar 03-Mar	23-Jun 19-Jul
Big Bar	51		Frame $Rotary_{inside}$ $Rotary_{outside}$	15-Apr 23-Mar 08-Apr	26-Apr 23-Jun 30-July
Tributary Location					
Shasta River	176.6	0.1	Rotary	18-Feb	08-July
Scott River	143	4.9	Rotary	18-Feb	01-July
Horse Creek	147	2.5	Frame Frame Frame	26-Feb 21-Apr 27-May	16-Apr 03-Jul 27-Jun
Seiad Creek	130	0.2	Frame Frame Frame	03-Mar 23-Mar 20-Apr	19-Mar 27-May 03-Jul
Elk Creek	169.8	0.2 1.0	Rotary Frame	31-Mar 29-May	03-Jun 25-Jul
Salmon River	66	1.6	Rotary	6-Apr	17-Oct

KFHAT Juvenile Fish Mortality Reconnaissance Survey, 2004

-Contributed by Mark Hampton, CDFG

In May of 2004, the USFWS, Yurok Tribe, and Karuk Tribe reported unusually high levels of mortality and disease infections among naturally produced juvenile Chinook salmon captured in downstream migrant traps fished in the Klamath River. Trapping efforts were located near

Kinsman Creek (RM 146) just upstream of the Scott River confluence, adjacent to the Bulk Plant in Happy Camp (RM 108), at Persido Bar (RM 81) upstream of the Salmon River confluence, and at Big Bar (RM 51) upstream of the Trinity River confluence. Infection rates and mortalities observed were highest at the most upstream sampling location near Kinsman Creek and tended to decrease in intensity downstream. The symptoms observed included bloated abdominal cavities, pale gills, bloody vents, and pop-eye. Infected fish also exhibited lethargic behavior, poor swimming ability and increased vulnerability to handling stress. The primary cause of the disease is most likely the myxosporean parasite *Ceratomyxa Shasta* (*C. shasta*) which is endemic to the Klamath River. Other potential diseases observed include another myxosporean parasite, *Parvicapsula minibicornis*, and the bacteria, *Flavobacterium columnare*.

On June 17th the CDFG requested that KFHAT take immediate steps to implement the Klamath River Fish Mortality Response Plan (Draft) to better determine the extent and magnitude of fish mortalities that were occurring within the Klamath River. The CDFG immediately contacted those members of KFHAT identified in the Fish Kill Monitoring and Response Network and a meeting of those representatives was held at the USFS Happy Camp Ranger Station on June 18, 2004. The purpose of the meeting was to review current conditions, determine the available labor force and equipment needs, develop sampling protocols, identify sample reaches, assign crews to reaches, discuss pertinent safety issues, and coordinate an appropriate response. Present at the meeting, either in person or over the telephone, were representatives from the CDFG, North Coast Regional Water Quality Control Board (NCRWQCB), USFWS, NOAA Fisheries, USFS, USBOR, Yurok Tribe, Karuk Tribe, Hoopa Valley Tribe, and SRRC.

KFHAT immediately recognized that an accurate quantification of juvenile salmonid mortalities in the Klamath River would not be possible given limited resources and other problems associated with sampling small fish in a large river system, which include loss to predators and scavengers, and rapid decay rates. Therefore, only reconnaissance level surveys were conducted and the sampling protocols were developed accordingly. Each reach was floated and a visual search was conducted for signs of dead or moribund fish. Every third pool and all backwaters or eddies where dead fish were likely to settle out were sampled by snorkel divers or underwater video equipment. In addition, crews also searched tributary mouths (thermal refugia areas) to determine the presence of live and dead fish that might have been using these locations. The numbers of dead fish, healthy fish, and fish showing symptoms of disease were estimated as best as possible at each sample location. KFHAT identified 19 survey reaches on the Klamath River between Gottville (RM 164.9) and Blake's Riffle (RM 8.5), and one survey reach in the lower 11 miles of the Trinity River. A total of four reconnaissance surveys were conducted by KFHAT between June 21 and July 20 of 2004.

Thirteen reaches, located between the Klamath River Community Center (RM 157.4) and the Big Bar River Access (RM 50.9), were surveyed on June 21 covering a total of approximately 87 river miles. A total of 269 dead Chinook salmon juveniles and more than 1,200 live Chinook salmon were observed during the survey. The majority of live Chinook salmon juveniles observed during the survey were seen in three survey reaches located between Wingate Bar (RM 99.4) and Persido Bar (RM 81.3). In these three reaches, the proportion of Chinook salmon that exhibited disease symptoms ranged from 26% to 63%. The majority of Chinook salmon juveniles observed were using the mainstem and only a few fish were found in thermal refugia areas. A survey conducted in the upper most reach, downstream of the town of Klamath River (RM 157.4), found numerous dead and decaying juvenile Chinook salmon in large floating mats of aquatic vegetation indicating that substantial mortalities of juvenile Chinook salmon likely occurred in this area during the weeks prior to our survey.

On June 28th the Yurok Tribe surveyed from Ikes Falls River Access (RM 65.2) below Ishi Pishi Falls downstream to Big Bar (RM 51) and on June 30th KFHAT conducted surveys from Sluice Box River Access (RM 127.5) downstream to Conrad Creek (RM 67.5) just upstream of Ishi Pishi Falls. Surveys were conducted in 9 reaches and covered approximately 68 river miles. A total 9 Chinook salmon juvenile mortalities and approximately 879 live Chinook salmon juveniles were observed during the survey. The incidence of diseased fish generally decreased in all areas of the survey to less than 25%. The number of live Chinook salmon juveniles observed also declined. These observations corresponded well with downstream trapping efforts which also showed a decline in numbers. Use of thermal refugia areas was light and mainly occurred late in the day as water temperatures increased.

Findings from the previous survey (June 30), along with findings reported by the Yurok Tribe for their downstream trapping effort at Big Bar (RM 51), indicated that the peak of the Chinook salmon emigration had moved downstream below the confluence of the Trinity River. The USFWS also reported catching 7 dead Chinook salmon juveniles in their plankton net operation near Blue Creek (RM 16.4) on July 1st. Downstream trapping efforts on the Shasta River and Scott River revealed that fairly large numbers (thousands) of Chinook salmon juveniles were still entering the Klamath River from these two tributary streams in late June. Therefore, KFHAT shifted more effort towards surveys in the lower Klamath River, downstream of the Trinity River, and also sampled two survey reaches in the upper river to try and determine the fate of those Chinook salmon entering the Klamath River from the Scott River and Shasta River.

The survey on July 7th covered approximately 75 river miles and the areas surveyed included one reach below the Shasta River (RM 164.9 to 158.1), one reach below the Scott River (RM 135.2 to 129.5), and 9 reaches in the lower river from Wingate Bar (RM 99.4) downstream to Blake's Riffle (RM 8.5). Only 1 live Chinook salmon juvenile was seen in the survey reach below the Shasta River and only 3 live Chinook salmon were seen in the survey reach below the Scott River. Unlike the previous two surveys, nearly all of the observations of juvenile Chinook salmon in the lower mainstem, upstream of the Trinity River, were limited to thermal refugia areas. Over 4,600 juvenile Chinook salmon were estimated to be using these thermal areas. The percentage of sick fish observed remained fairly consistent and ranged between 5% and 25%.

Downstream of the confluence of the Trinity River surveyors observed about 728 live Chinook salmon juveniles and although some of these fish were observed in the mainstem, the majority of fish were observed using thermal refugia areas at tributary mouths or in Blue Hole where cool water is known to enter the river from subsurface flows through the cobble bar. Eight dead Chinook salmon juveniles were observed during the survey, two in the mainstem, four at the mouth of Tectah Creek, and two at the bottom of Blue Hole in the mainstem. Only two of the live fish observed during this survey showed any symptoms of disease.

A total of seven reaches were surveyed in the Klamath River between Independence Creek (RM 94) and Blake's Riffle (RM 8.5) on July 20. An additional sample reach was added in the lower Trinity River from the Hoopa Valley downstream to the mouth (11.3 river miles). This reach was added to the reconnaissance survey to try and determine whether any symptoms of disease were present among juvenile Chinook salmon in the lower Trinity River. The survey covered approximately 56 miles of the Klamath River and 11 miles in the Trinity River.

Only 370 live Chinook salmon juveniles were seen on the mainstem Klamath River from Independence Creek to the confluence of the Trinity River. All of these fish were observed in thermal refugia areas. The incidence of diseased and dead fish also decreased substantially. Only

one dead Chinook salmon juvenile was observed and the incidence of diseased Chinook salmon juveniles ranged from 0% to 15%.

Approximately 526 live juvenile Chinook salmon and 4 dead juvenile Chinook salmon were observed in the Klamath River downstream of the Trinity River confluence. Many of these fish were found using the mainstem and were not associated with thermal refugia. However, up to 60 juvenile Chinook salmon were observed in the thermal refugia habitat at the mouth of Tectah Creek. In the lower Trinity River all of the fish observed appeared to be in good condition and were well distributed throughout the reach.

The reconnaissance surveys that were conducted between June 21 and July 20 indicate that large numbers of juvenile Chinook salmon in the Klamath River died of disease most likely caused by the mxyosporean parasite *C. shasta*. Findings are consistent with observations that were conducted at various downstream migrant trapping operations throughout the Klamath River. It also appears, based on infection rates observed in downstream migrant trapping efforts, that the peak of the disease epizootic and associated mortalities of juvenile Chinook salmon likely occurred prior to the onset of the reconnaissance survey effort. Should downstream trapping efforts find high levels of disease among juvenile Chinook salmon in the future, KFHAT should make every effort to initiate reconnaissance surveys earlier in the season to better document the magnitude and extent of the disease outbreak. This is critically important if appropriate management actions are to be implemented that could help alleviate the impacts of disease on the Chinook salmon population in a timely fashion.

The final results of these efforts are anticipated to be released in the summer of 2005 by the CDFG in a report titled 2004 Klamath River Juvenile Fish Mortality Reconnaissance Survey. For further information please contact Mark Hampton of the CDFG at (530) 842-3109 or <mhampton@dfg.ca.gov>.

Juvenile Fish Health During Emigration

-Contributed by Charlie Chamberlain, USFWS

In the spring of 2004, Klamath River frame and rotary screw trap sites operated by the USFWS and/or Karuk Department of Natural Resources included those at Bogus Creek (RM 189), I-5 (RM 180), Kinsman Creek (RM 146), Happy Camp (RM 108), Persido Bar (RM 81), and at Big Bar (RM 51). These traps were operated primarily for Klamath River Flow Study and/or juvenile coho investigation purposes. Most began operation in early March and ceased by early summer.

In early May 2004, well before the first Iron Gate Hatchery release of Chinook occurred, crews operating the traps at the Kinsman Creek (RM 146) site in the Klamath River noted a marked increase in mortality and "sick" wild fish in the traps. The incidence of clinical signs of sickness in both the rotary screw trap and the frame trap climbed from near zero to almost 100% (Figure 2). Similar results were recorded in the downstream traps at Happy Camp (RM 108) and Persido Bar (RM 81) a week to several weeks later. As a result of the high incidence of mortality and disease-symptomatic fish observed in the 2004 trapping network above, NOAA Fisheries provided funding for the USFWS to investigate disease conditions at multiple mainstem trapping sites. Young of year Chinook salmon (*O. tshawytscha*) were also collected by the USFWS using beach seines in the Klamath River at Klamathon (also know as Copco-Agar) Bridge (RM 181), near the boat ramp at Trees of Heaven Campground (RM 172), just downstream of the Walker Road Bridge in Klamath River (RM 156.5), downstream of McGarvy Creek (RM 10.6) near Terwar, and in the Estuary at Dads Camp on the South Slough (RM 1). A technical report titled Disease symptoms in Klamath River juvenile salmonids from multiple locations – Spring-Summer 2004 is being authored by Isaac Sanders of the USFWS and is expected to be available

electronically in final form in the spring of 2005 at <http://arcata.fws.gov>. For further information please contact Tom Shaw at the USFWS, (707) 822-7201, <tom.a.shaw@fws.gov>.

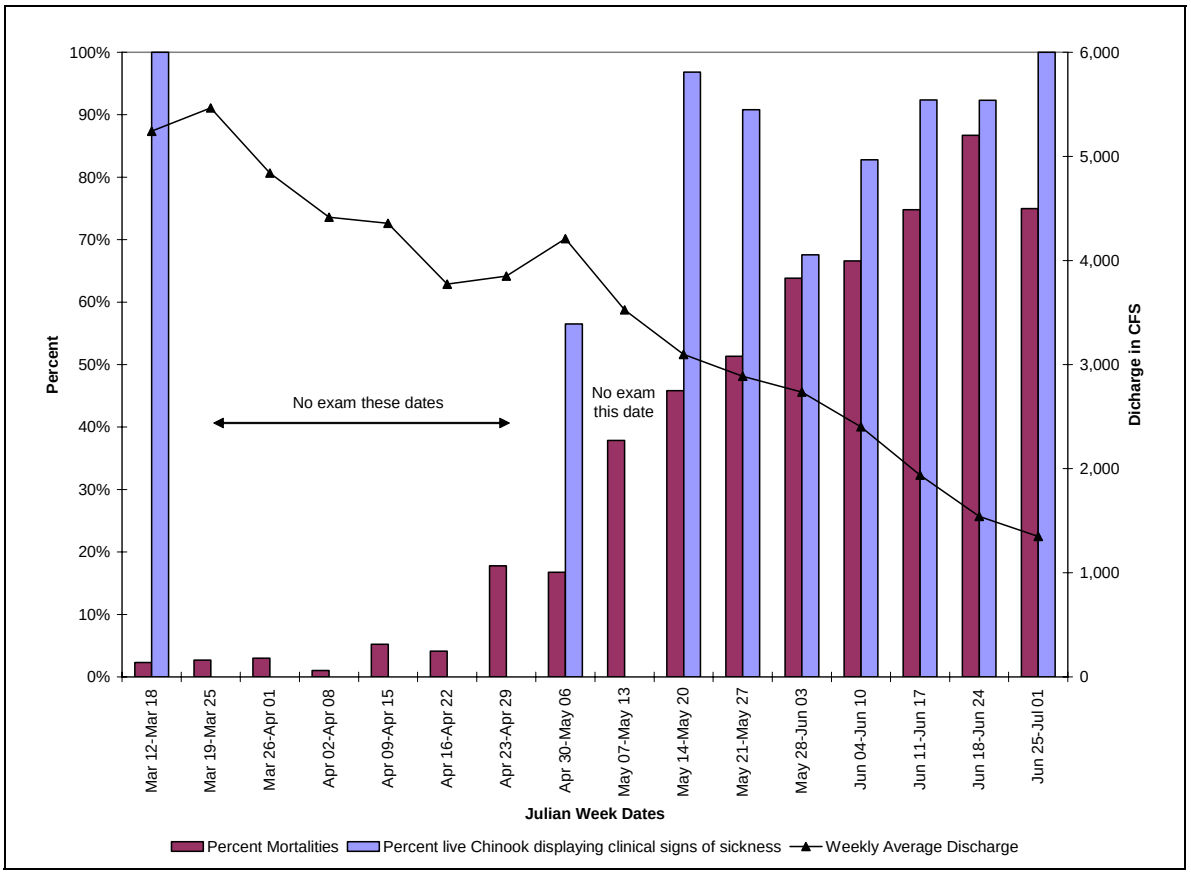


Figure 2: Percent of the weekly frame-trap catch of Chinook salmon that were dead, percent of the remaining live Chinook examined that exhibited outward clinical signs of disease, and weekly average discharge at the Kinsman trap site (RM 146) on the Klamath River near the mouth of the Scott River in 2004.

Juvenile Chinook Salmon Pathology Monitoring

-Contributed by Charlie Chamberlain, USFWS

In a study funded by the Klamath River Basin Fisheries Task Force, the USFWS California-Nevada Fish Health Center (CA/NV FHC) conducted weekly pathogen monitoring on the Klamath River from May 11 through July 27, 2004. Monitoring sites included rotary screw traps at Big Bar (RM 51) and Persido Bar (RM 81) and a roving beach seine conducted between Bluff Creek (RM 50) and Persido Bar. The weekly incidence and severity of *Ceratomyxa shasta* (*C. Shasta*) and *Parvicapsula minibicornis* (*P. minibicornis*) was assessed by histology; other pathogens were noted as encountered. Observed incidence of infection was expanded using trap efficiency data from the Big Bar trap to estimate the total portion of Chinook salmon smolts that were affected by these pathogens.

The incidence of *C. shasta* infection ranged from 19% to 69%, and the total portion of the population infected was estimated to be 45%. The incidence of *P. minibicornis* ranged from 39% to 96%, and the total portion of the population infected was estimated to be 94% (Nichols 2005, Personal Communication). Completion of a final report is anticipated in spring of 2005 and will be made available electronically at <http://arcata.fws.gov>. For additional information regarding

this study please contact Ken Nichols at the USFWS CA-NV FHC, (530) 365-4271, <Kenneth.Nichols@fws.gov>.

Juvenile Salmonid Live Cage Sentinel Exposure Study

-Contributed by Charlie Chamberlain, USFWS

In June of 2004, Dr. Scott Foott of the USFWS CA/NV FHC assisted Dr. Jerri Bartholomew of Oregon State University's Center for Fish Disease Research in conducting a sentinel study with fish known to be susceptible to *C. shasta*. A Cape Cod strain of rainbow trout (*O. mykiss*) from Roaring River and Oak Springs in Oregon were held in live-cages and exposed to ambient water at locations throughout the length of the Klamath River and various tributaries to test for differences in the severity of *C. shasta*. The fish were subsequently reared in a laboratory and monitored for 100 days post-exposure. Researchers then documented the resulting percent mortalities and the prevalence of *C. shasta* in these fish (Figure 3).

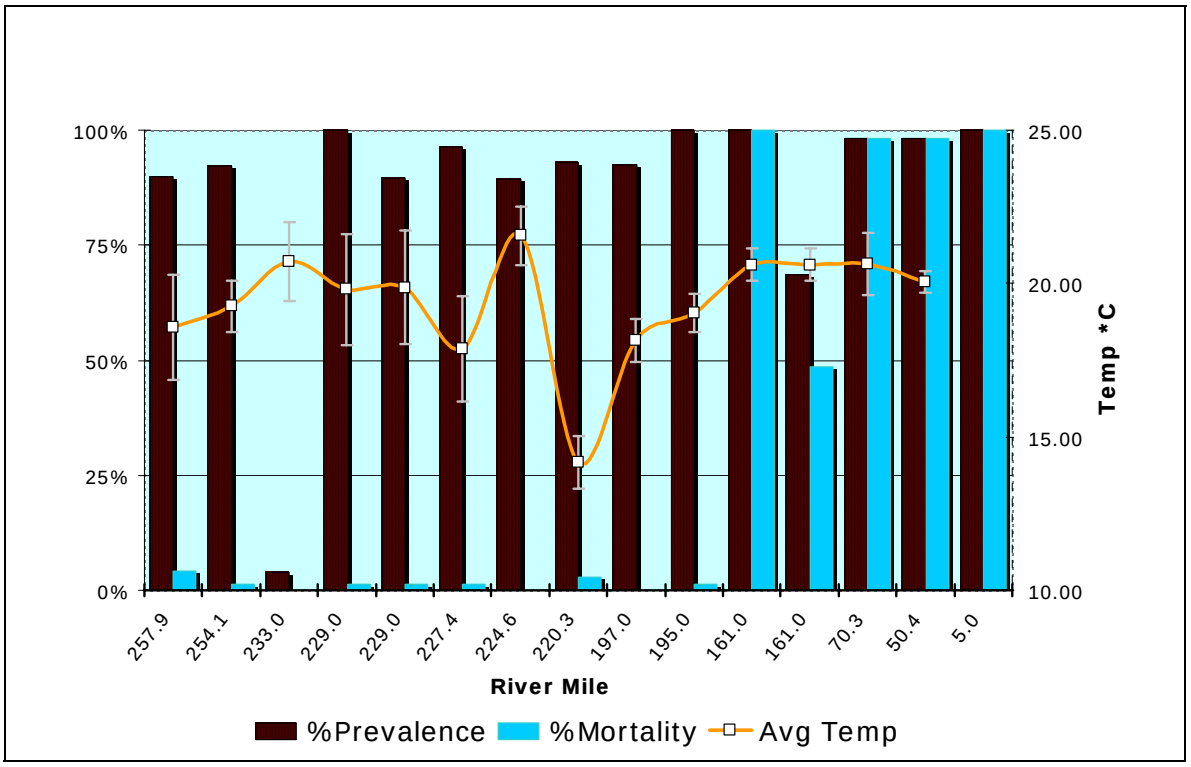


Figure 3: *Ceratomyxa shasta* mortality and infection prevalence data from Klamath Basin sentinel exposures conducted June 18 – 21, 2004. Seventy susceptible rainbow trout (Oregon Cape Cod strain) were exposed at each location and monitored for 100 days post exposure. Figure provided by Rick Stocking and Dr. Jerri Bartholomew of Oregon State University's Center for Fish Disease Research, from a study funded by Oregon Sea Grant.

Of particular interest are the results from Klamath River exposures downstream of Iron Gate Dam (RM 195) where nearly 100% of the trout exposed exhibited *C. shasta* and mortality. This far surpassed the mortality of fish from sites upstream of Iron Gate Dam. Additionally, none of the sentinel fish exposed to tributary waters upstream or downstream of Iron Gate Dam were infected with *C. shasta*.

For further information on this project and anticipated report please contact Dr. Jerri Bartholomew at Oregon State University's Center for Fish Disease Research, (541) 737-1856, <jerri.bartholomew@oregonstate.edu>.

The USFWS CA/NV FHC also held auxiliary sentinel cages with Iron Gate Hatchery Chinook (*O. tshawytscha*) on the Klamath River near Beaver Creek. Exposure times varied in these groups from 6 to 24 hours; the 6-hour groups were exposed during different periods to test for diurnal differences. All groups showed a high prevalence of *C. shasta* regardless of exposure duration or diurnal period of exposure (Foott 2005, Personal Communication). The 24 hour exposure groups exhibited it faster (higher challenge dose through longer exposure). Of the Chinook exposed at Beaver Creek, 68% exhibited prevalence of *C. shasta*, and 49% experienced mortality. All exposure groups were also infected in the kidney with *P. minibicornis*. As was the case with *C. shasta*, the 24 hour exposure group exhibited signs of infection faster than the 6 hour group (effect of challenge "dose"). The time from exposure to mortality for those fish that died was generally much faster for Chinook than for the rainbow trout (within 18 days for Chinook compared to up to 100 days for trout). For more information regarding the supplemental Chinook portion of this sentinel project, contact Dr. Scott Foott of USWFS CA-NV FHC at (530) 336-4271, <scott.foott@fws.gov>.

Juvenile Fish Kill Assessment Surveys

-Contributed by Ryan Benson, YTFP

In June and July of 2004, the Yurok Tribal Fisheries Program (YTFP) conducted 10 juvenile fish kill assessment surveys on the Klamath River. The purpose of the assessment was to document any sick and dead juvenile salmonids. In general, YTFP personnel surveyed once per week from Big Bar (RM 51) to Young's Bar (RM 33.8) for five weeks. The exception was the first week, when crews surveyed from Ike's Falls (RM 65) to Weitchpec (RM 43.5), and the final week when crews surveyed from Big Bar to Weitchpec. Personnel floated in rafts and searched for dead or sick fish, indicated by non-typical behavior or external signs of disease. Snorkel surveys were conducted in pools and thermal refugia. Samplers enumerated all live, dead, and unhealthy looking salmonid and non-salmonid fishes. In addition, stream temperature was recorded at all snorkel-survey sites. Fish observations are summarized in Table 2.

Table 2: Results of the juvenile fish kill assessment surveys on the Klamath River, June-July 2004.

Week Beginning	River Section	RM	Mean Water Temperature (^{o}C)	Number of Live Chinook	Number of Dead Chinook	Number of Sick Chinook	Other Dead Spp.
28-Jun-04	Ike's- Weitchpec	65- 43.5	21.1	777	19	15	5 steelhead
5-Jul-04	Big Bar- Young's Bar	51- 33.8	21.2	4374	3	6	1 steelhead
12-Jul-04	Big Bar- Young's Bar	51- 33.8	20.5	1491	1	4	2 steelhead
19-Jul-04	Big Bar- Young's Bar	51- 33.8	22.4	467	1	3	
26-Jul-04	Big Bar- Weitchpec	51- 43.5	24.9	65	0	0	
			TOTAL	7174	24	28	8

The majority of fish observed were juvenile Chinook salmon (*Oncorhynchus tshawytcha*) followed by juvenile steelhead (*Oncorhynchus mykiss*). Live adult Chinook and steelhead observed were 7 and 154, respectively. Personnel observed only one dead and one sick adult Chinook salmon. For further information please contact Ryan Benson of the YTFP at (530) 625-4130 or <ryanlbenson@hotmail.com>.

Adult Salmonids

KFHAT Adult Salmonid Reconnaissance Survey, August 18th, 2004

-Contributed by Sara Borok, CDFG

On August 18th, 2004 members of KFHAT conducted a reconnaissance survey in the lower Klamath River in response to numerous reports from anglers about dead fish in the area. The river was divided into two reaches: Pecwan Creek (RM 25.3) to Blue Creek (RM 16.5), and Blue Creek to Mouth. The participants of this survey were: Sara Borok, Wade Sinnen, and Paul Weldon- CDFG, Mark Sanderson- Yurok Tribe, Rich Piaskowski – USBOR, Rick Rodgers – NOAA Fisheries, Scheylar Grove, Jason Ogawa and Mike Long – USFWS. KFHAT members documented the presence/absence of adult salmonids and their relative numbers and locations. Team members dove or used underwater cameras to observe any significant holding habitat for adult salmonids. The relative abundance (none, few, some, lots) and percent species were recorded. If carcasses were encountered an external exam was conducted and the species, condition, size, and parasite count were recorded.

In the Klamath River reach from Pecwan Creek down to the river bend above Blue Creek no live adult salmonids were observed. One 101 cm male Chinook salmon dead at least 3 days was found on the river bank at the river bend above Blue Creek. In Blue Hole "some" live adult salmonids were observed (80% steelhead and 20 % Chinook), and 5 dead salmonids were documented (three were somewhat fresh and two were old). In the pool at the mouth where Blue Creek flows into the Klamath River "some" live adult salmonids were observed, mostly steelhead. One fresh looking dead ~35 cm steelhead and one older adult steelhead carcass were observed.

In the reach below Blue Creek 2 floating, non-fresh, ad-clipped adult steelhead were observed, and two adult steelhead and an adult Chinook carcass were observed on the bank. An underwater camera was used in Lams Riffle (RM 14), although no adult salmonids were observed. The camera was used again at a hole above Blakes Riffle (RM 8.5); no adult salmonids were observed. At the Roy Rook/Terwar boat ramp steelhead were observed jumping in the morning. In the pool below Terwar Creek a few salmonids (both Chinook and steelhead) were observed. In the estuary at the mouth of the Klamath River the underwater camera was used again, although no fish were observed. Lots of fishermen were out but there was little activity in the nets. From the mouth of Hunter Creek up to around Paul's Cannery there was lots of seals and sea lion activity and teams saw 3 sea lions with salmon.

Overall KFHAT members observed 13 fish carcasses, which was concurrent with the information from anglers on the river. There were no significant signs of disease on any of the dead fish, and cause for mortality was assumed to be hooking mortality. It appeared that new adult fish were in the process of entering the mouth of the river, but that adult fish had not moved above Blue Creek. For additional information on this survey please contact Sara Borok with the CDFG at (707) 822-0330, or <sborok@dfg.ca.gov>.

Klamath River Basin Fall Chinook Salmon Run-Size Estimate

-Contributed by Sara Borok, CDFG

The numbers of fall-Chinook salmon entering the Klamath River (run-size) is determined by adding the number of fish harvested in-river, the number that return to the two Basin hatcheries, and the number that spawn naturally. Since 1978, the angler harvest of Klamath River fall Chinook has been monitored by the CDFG. Since 1994, the Yurok Tribe has monitored the Yurok Tribes' net harvest in the lower Klamath River, and since 1981, the Hoopa Valley Tribe has monitored the Hoopa Tribal harvest in the Trinity River. Beginning in 1992 the USFS, Karuk Tribe, volunteer organizations, landowners and local schools have worked in cooperation with the

CDFG, and the Yurok and Hoopa tribes to gather numbers of naturally spawning fish in the various tributaries to the Klamath and Trinity Rivers. Fall Chinook spawner escapement, in-river harvest, and run-size estimates for 2002 to 2004 are presented in Table 3.

Table 3: Klamath River Basin Fall Chinook Spawner Escapement, In-River Harvest, and Run-Size Estimates for 2002-2004.

Klamath River Basin Fall Chinook Salmon Spawner Escapement, In-river Harvest and Run-size Estimates, 1978-2004 a/

SPAWNER ESCAPEMENT

	2002			2003			2004		
Hatchery Spawners	Grilse	Adults	Totals	Grilse	Adults	Totals	Grilse	Adults	Totals
Iron Gate Hatchery (IGH)	1,294	23,667	24,961	290	31,970	32,260	836	10,683	11,519
Trinity River Hatchery (TRH)	1,037	3,516	4,553	586	29,805	30,391	1,044	12,399	13,443
Hatchery Spawner Subtotals:	**2,331**	**27,183**	**29,514**	**876**	**61,775**	**62,651**	1,880	23,082	24,962
Natural Spawners									
Main Stem Klamath River n/									
(excluding IGH)	658	21,650	22,308	298	17,722	18,020	204	5,038	5,242
Shasta River basin	386	6,432	6,818	155	4,134	4,289	129	833	962
Scott River basin	47	4,261	4,308	65	11,988	12,053	22	445	467
Salmon River basin	78	2,669	2,747	73	3,302	3,375	96	530	626
Bogus Creek basin	304	17,530	17,834	183	15,018	15,201	295	3,493	3,788
Misc. Klamath tributaries o/									0
(above Yurok Reservation)	44	1,344	1,388	38	1,761	1,799	80	477	557
Yurok Reservation tribs. (Klamath River) p/	12	339	351	31	1,094	1,125	64	144	208
Klamath Natural Spawner Subtotals:	**1,529**	**54,225**	**55,754**	**843**	**55,019**	**55,862**	890	10,960	11,850
Main Stem Trinity River dd/									
(excluding TRH)	2,230	10,880	13,110	1,056	31,332	32,388	3,799	12,885	16,684
Misc. Trinity tributaries o/									0
(above Hoopa Reservation)	66	324	390	109	602	711	75	258	333
Hoopa Reservation tribs. (Trinity River) p/	42	206	248	80	444	524	42	144	186
Trinity Natural Spawner Subtotals:	**2,338**	**11,410**	**13,748**	**1,245**	**32,378**	**33,623**	3,916	13,287	17,203
Natural Spawner Subtotals:	**3,867**	**65,635**	**69,502**	**2,088**	**87,397**	**89,485**	4,806	24,247	29,053
Total Spawner Escapement	**6,198**	**92,818**	**99,016**	**2,964**	**149,172**	**152,136**	6,686	47,329	54,015

IN-RIVER HARVEST

	2002			2003			2004		
Angler Harvest	Grilse	Adults	Totals	Grilse	Adults	Totals	Grilse	Adults	Totals
Klamath River (below Hwy 101 bridge)	274	3,285	3,559	180	1,589	1,769	723	750	1,473
Klamath River (Hwy 101 to Coon Cr Falls)	284	3,268	3,552	369	3,336	3,705	1,444	1,521	2,965
Klamath River (Coon Cr Falls to IGH)	93	3,216	3,309	40	2,397	2,437	51	1,266	1,317
Trinity River basin above Weitchpec aa/	219	726	945	227	2,379	2,606	397	496	893
Angler Harvest Subtotals:	**870**	**10,495**	**11,365**	**816**	**9,701**	**10,517**	2,615	4,033	6,648
Indian Net Harvest e/									
Klamath River (below Hwy 101 bridge)	17	20,149	20,166	15	22,548	22,563	52	20,877	20,929
Klamath River (Hwy 101 to Trinity mouth)	41	3,257	3,298	17	4,578	4,595	70	3,086	3,156
Trinity River (Hoopa Reservation)	68	1,168	1,236	12	2,771	2,783	16	1,615	1,631
Indian Net Harvest Subtotals:	**126**	**24,574**	**24,700**	**44**	**29,897**	**29,941**	138	25,578	25,716
Total In-river Harvest	**996**	**35,069**	**36,065**	**860**	**39,598**	**40,458**	2,753	29,611	32,364

IN-RIVER RUN

	2002			2003			2004		
Totals	Grilse	Adults	Totals	Grilse	Adults	Totals	Grilse	Adults	Totals
In-river Harvest and Escapement	7,194	127,887	135,081	3,824	188,770	192,594	9,439	76,940	86,379
Angling Mortality (2.04% of harvest) f/	18	214	232	17	198	215	53	82	136
Net Mortality (8.70% of harvest) f/	11	2,137	2,148	4	2,600	2,604	12	2,224	2,236
Fish Die Off ee/	2,003	30,550	32,553						
Total In-river Run	**9,226**	**160,788**	**170,014**	**3,845**	**191,568**	**195,413**	9,504	79,246	88,751

Source: KRTAT 2005.

The pre-season projection for the Klamath Basin run-size was 98,600 adult fall Chinook (KRTAT 2004). The preliminary estimated run-size is 79,246 adults and 9,504 grilse, for a total of 88,751,

although results are still being calculated at this time. The minimum floor escapement (35,000) for naturally spawning adults was not met this season. Only 24,247 naturally spawning adults were estimated.

On the Klamath side above the confluence with the Trinity River the three year old component of the Chinook run is rather weak when compared to past years. It is especially evident in the Scott River, which had the lowest returns since 1978. This is the first time the Scott has had a lower return than the Salmon River, which also had its lowest returns. The Trinity River had a strong three year old fish component this season. Grilse (a young male salmon returning to spawn after only one year in the ocean) in the Basin were higher this year than in the last couple of years, which may bode well for future returns. For additional information please contact Sara Borok with the CDFG at (707)822-0330 or <sborok@dfg.ca.gov>.

Coho Carcass Survey on Shackleford Creek

-Contributed by Rebekah Sluss, Quartz Valley Indian Reservation (QVIR)

The Quartz Valley Indian Reservation is a total of 694 acres with 143 tribally owned acres. Shackleford Creek runs through the Reservation for approximately half a mile. Fisheries monitoring is conducted on the Reservation to determine the extent and distribution of coho spawning. On January 10th, 2005 six Coho redds were counted and one Coho carcass was found by USFS surveyor Brain Drew. This is the first season that coho redds and carcasses have been documented on the Reservation's portion of Shackleford Creek. Please contact Rebekah Sluss, Quartz Valley EPA Director at (530) 468-5907 or <rebekahqvir@yahoo.com> for more information.

Mid-Klamath Adult Fall Chinook Monitoring

-Contributed by LeRoy Cyr, USFS

Counts of fall Chinook spawning sites (redds) were made by the USFS, CDFG, Yurok, Karuk, and Quartz Valley Tribes, SRRC, Mid-Klamath Watershed Council, Siskiyou Resource Conservation District, and numerous other volunteers in a number of watersheds along the Klamath River from early October through late December of 2004. Crews of at least two were assigned to walk and/or swim in a downstream direction looking for spawning activity and enumerating redds, identifying and counting live adult salmon and steelhead, and gathering biological and demographic information by examining, measuring and taking scale samples from adult Chinook salmon carcasses. In 2004, 454 miles of stream were surveyed. Bluff, Red Cap, Camp, Dillon, Clear, Elk, and Grider Creeks, and the Salmon and lower Scott Rivers were surveyed a minimum of once every two weeks. In addition, index reaches in Aikens, Slate, Boise, Perch, Thompson and Wooley Creeks were assessed during the spawning season.

Redds within surveyed Klamath watersheds were tallied by reach so that the number and distribution of redds could be compared geographically across years and so that a consistent data trend could continue to be developed. In most surveyed watersheds during the 2004 season, the total number of fall Chinook redds reflected one of the lowest years on record. Only a few adult salmonids showed any signs of gross abnormalities, such as hemorrhaging, open lesions and discoloration. If you need more information or have any questions concerning these surveys or other previous years, please contact LeRoy Cyr at the Orleans Ranger District of the Six Rivers National Forest, <lcyr@fs.fed.us>, (530) 627-3291 or Jon Grunbaum at the Happy Camp Ranger District of the Klamath National Forest, <jgrunbaum@fs.fed.us>, (530) 493-1719.

Mid-Klamath Adult Spring Chinook and Summer Steelhead Monitoring

-Contributed by LeRoy Cyr, USFS

The USFS and SRRC have collaborated with a number of agencies, Tribes, and volunteers to perform spring-run Chinook salmon and summer-run steelhead trout surveys within the Salmon River Basin since 1980. At least two individuals are assigned to a stream reach, and swim in a downstream direction identifying and counting live adult salmon and steelhead. Spring-run Chinook populations have ranged in size from a high of 1,473 fish in 1995 to a low of 132 fish in 1989. The mean over the 24 year survey period is 607 spring-run Chinook. The 2004 population size estimate for the Salmon River Basin was 422 Chinook, which is approximately 30 percent below the mean.

Summer-run steelhead populations have ranged from a high of 804 fish in 1988 to a low of 49 fish in 1997. The mean over the 24 year period from 1980 to 2004 is 237 summer-run steelhead. The population size estimate in 2004 was approximately 54 percent below the mean or 108 summer-run steelhead. In August of 2004, a total of 77 miles of the Salmon River mainstem, North and South Forks were surveyed. Five Chinook salmon and two half-pounder steelhead were found to be prespawning mortalities within the South Fork of the Salmon River. No internal or external examinations were described or tissue samples taken. If you need more information concerning Salmon River surveys, please contact Brenda Olson at the Salmon River Ranger District of the Klamath National Forest, <bjolson@fs.fed.us>, (530) 468-1287.

Since 1985, the USFS has conducted summer steelhead surveys on many Klamath tributaries in the Six Rivers and Klamath National Forest. A total of 106 miles of stream within Bluff, Red Cap, Camp, Wooley, Dillon, Clear, Elk, Indian, Thompson and Grider Creeks were surveyed in July or August of 2004. During these adult steelhead surveys, no fish were found dead or exhibiting signs of stress. If you need more information or have any questions concerning these surveys or other previous years, please contact LeRoy Cyr at the Orleans Ranger District of the Six Rivers National Forest, <lcyr@fs.fed.us>, (530) 627-3291 or Jon Grunbaum at the Happy Camp Ranger District of the Klamath National Forest, <jgrunbaum@fs.fed.us>, (530) 493-1719.

Trinity Pulse Flow and Klamath/Trinity River Adult Salmonid Pathology Monitoring

-Contributed by Charlie Chamberlain, USFWS

In 2004, the USBOR (Bureau) purchased water which could be released from Lewiston Dam to the Trinity River to reduce the risk of a fish kill for returning salmonids, should the need arise. In August of 2004, the Trinity Management Council (TMC) evaluated developing environmental conditions in the Lower Klamath River and made a recommendation to the Bureau to proactively release this supplemental water to protect returning Trinity River salmonids. Also, the TMC recommended holding additional water in reserve should disease or other conditions warrant release of even more water in an emergency action. Pathology monitoring for the primary target organisms of concern *Ichthyophthirius multifiliis* (Ich) and *Flavobacterium columnare* (columnaris), and a decision structure to define conditions that would warrant an additional emergency release of water were implemented. A memorandum on this subject titled Fall flow monitoring plan 2004-Recommendation to the Trinity Management Council dated August 17, 2004 is available from the USFWS electronically at <http://arcata.fws.gov>.

Using intensive fishing with gillnets to capture adequate sample sizes of adult salmonids, and employing low power dissection microscopes to inspect gill sections for parasites, pathology sampling was conducted weekly by the Yurok Tribal Fisheries Program(YTF) and USFWS in the lower Klamath River immediately downstream of Blue Creek (RM 16) and by the YTF immediately downstream of the Trinity River at Weitchpec (RM 43). Fish from the tribal fisheries on the Trinity River in Hoopa Valley were similarly sampled by the Hoopa Valley Tribal Fisheries Department. Slide imprints were taken from a subsample of fish from all areas.

In all, the gills of 413 fish (329 Chinook, 50 coho, and 34 steelhead) were inspected over the period of August 8 to October 27, 2004.

Organism counts peaked in early September with all 27 of the Chinook inspected at Weitchpec the week of September 8 having positive counts. However, based on the USFWS fish pathologist review of the slide imprints, very few Ich parasites were positively detected from any of the sample locations over the period sampled. A much higher infection of the non-target organism *Nanophyetus sp.* was observed. Positive organism counts (*Nanophyetus* and/or Ich) were detected in the gills of only two of the 34 steelhead examined (6%) and two of the 50 coho salmon examined (4%), whereas organisms were detected in 153 of the 329 Chinook gills inspected (47%). It is not known whether there is a species-specific vulnerability to infections from these organisms or if behavioral or timing differences lead to the large disparity in infection rates. Additional results from this study will be made available electronically at <http://arcata.fws.gov> in the spring of 2005. For questions please contact Charlie Chamberlain, USFWS, (707) 822-7201, <Charles.Chamberlain@fws.gov>.

Reconnaissance floats were conducted during the period of August 24 to September 16 to evaluate whether the augmented flow from the Trinity River triggered Klamath River fish to move upstream above the Trinity. These floats were performed bi-weekly on the Klamath River from Orleans (RM 59) to Big Bar (RM 51) by the Karuk Tribal Natural Resources Department, and weekly from Big Bar to Weitchpec (RM 43) by the Yurok Tribal Fisheries Department. Large aggregations of adult Chinook were not observed in the Klamath above the Trinity River. There were several steelhead holding in a couple of thermal refugia areas above the Klamath River, but the highest numbers were observed before the pulse of Trinity River water reached Weitchpec. For additional information about this study please contact Charlie Chamberlain, USFWS, (707) 822-7201, <Charles.Chamberlain@fws.gov>.

Trinity River Spring Chinook Mortality Survey

-Contributed by Charlie Chamberlain, USFWS

Corresponding with relatively strong (at least for recent history) spring Chinook runs in 2002 and 2003, pre-spawning mortality of these runs increased in visibility and raised concern about the susceptibility of this race to a mid-summer fish kill. As a result, surveys were conducted by the USFWS, CDFG, Hoopa Valley Tribal Fisheries Department, Yurok Tribal Fisheries Department, and USFS in the Trinity River in the summer of 2003 and 2004.

In 2003, surveys were conducted from July into early August. Observations included 135 spring Chinook, 12 steelhead, and 2 brown trout carcasses. The estimated total run-size for returning Trinity River adult and jack spring Chinook in 2003 was 47,795 (Sinnen 2005, Personal Communication). In 2004, a reconnaissance survey of the Trinity River was conducted in late July and early August to again look for pre-spawn mortality of spring-run Chinook salmon. A total of 28 identifiable Chinook carcasses, 7 steelhead, and 2 unidentifiable adult salmonids were found during the survey. Because of the low numbers of carcasses and low number of live fish observed during the surveys, no additional surveys were conducted for Trinity River spring Chinook mortality in 2004. The 2004 estimated Trinity River spring Chinook run was much smaller than 2003 at 13,890 adults and jacks (Sinnen 2005, Personal Communication).

A technical report titled Mainstem Trinity River spring Chinook salmon (*Oncorhynchus tshawytscha*) pre-spawning mortality survey, 2003 and 2004 by Michael Reichmuth and Charlie Chamberlain of the USFWS is being developed and is expected to be available electronically in final form in spring of 2005 at <http://arcata.fws.gov>. For further information on this project

and report please contact Charlie Chamberlain, USFWS, (707) 822-7201, <charles.chamberlain@fws.gov>.

Trinity River Spawning Surveys

-Contributed by Anita Andazola, USFS

Spawning surveys were conducted from October 20, 2004 through January 11, 2005 on four tributaries to the Trinity River and one tributary to the South Fork Trinity River. Horse Linto, Cedar, Willow, Sharber-Peckham, and Madden creeks were surveyed approximately every five days, although the total number of surveys for each creek differs. For example, Horse Linto Creek surveys began the week of 25 October while those on Sharber-Peckham Creek were delayed until the first week of December to allow river levels to rise sufficiently. For the 2004 season, 10.2 miles of stream was surveyed. A combined escapement of 585 chinook and 43 coho represents a 41% return from that recorded in 2003.

USFS personnel, DFG, NOAA Fisheries, AmeriCorps Watershed Steward Project, and volunteer cooperators conducted surveys. Each crew walked along their assigned stream reach, reporting spawning activity and established redds. Additional biological information was collected by examining the carcasses retrieved, measuring their length ,and taking scale samples for age composition. All retrieved carcasses were assessed to determine reproductive status (pre- or post-spawn) and were checked for signs of disease. Carcasses were checked to determine whether they wild or hatchery fish, and when applicable the hatchery of origin was noted. All coho and steelhead from the Trinity River hatchery receive right maxillary clips. One-quarter of Chinook from the Lewiston Hatchery, on the Trinity River, receive an adipose fin clip and a coded wire tag (CWT). Iron Gate Hatchery fish, Klamath River, receive left maxillary clips and 5% of their Chinook production receive an additional adipose clip and CWT. The anterior portion of the neurocranium is taken to retrieve CWT on retrieved ad-clipped Chinook carcasses. All coho heads are retrieved to monitor straying from Oregon's Rogue River, which inserts CWT in all their coho and externally marks 25% of their production.

Carcasses showed no sign of disease or abnormalities, such as hemorrhaging, open lesions or discoloration. For more information concerning these surveys and previous surveys, please contact Anita Andazola, USFS, at the Lower Trinity Ranger District, Six Rivers National Forest, <aandazola@fs.fed.us>, (530) 629-2118.

Adult Chinook Salmon Radio Telemetry Research Project

-Contributed by Josh Strange, YTEP

Riverine conditions influence the behavior of adult salmon during their spawning migration, and this resultant behavior affects the level of enroute success versus failure. Thus the overarching goal of this research effort is to gain a comprehensive understanding of adult Chinook migration behavior in the Klamath River Basin (KRB) in relation to the interactions and consequences of these behavioral tactics with ambient riverine conditions. Behavioral tactics include the use of thermal refuges to stay cool during periods of high water temperature, timing migration to coincide with favorable conditions, adjusting swim speeds, and adjusting river entry timing.

The 2004 Adult Chinook Radio Telemetry Research Project is a continuation of on-going adult Chinook migration studies that were initiated fully in 2003. This Project is led by the Yurok Tribal Fisheries Program (YTFP) with collaboration from the USFWS, Hoopa Tribe, and Karuk Tribe with in-kind support and services from the USFS, CDFG, SRRC, and USGS. Primary funders have included the Trinity River Restoration Program, the Klamath Basin Fisheries Restoration Task Force, Pacific Salmon Recovery Funds (via the Klamath River Intertribal Fish

and Water Commission), and the National Science Foundation GRFP. All data and statements herein are preliminary.

This Project relied on temperature sensitive esophageal radio transmitters (Advanced Telemetry Systems- ATS) to track the movements and monitor the internal body temperatures of adult Chinook salmon during their upriver spawning migration in the KRB. We captured and tagged approximately 100 adult Chinook throughout the run (May to October) primarily at the mouth of the Klamath River and tracked them to their respective holding areas, spawning areas, or natal tributaries to the best of our abilities. We also obtained data from a network of up to 16 automated listening stations, internal archival temperature devices (Alpha Mach iB series) attached to the radio transmitters, and multi-agency river temperature and flow monitoring.

Preliminary examination of 2004 data shows that four primary groupings of migration behavior were observed approximately coinciding with pulses of fish initiating migration during spring (June), summer (early August), fall (Sept), and late fall (Oct). These behavioral groupings were based on the timing of estuary entry (and subsequent tagging), freshwater (above the estuary) migration timing, and migration behavior. Detailed analysis and preparation of technical reports and peer-reviewed publications are currently being developed by the YTFP staff and will be available for public consumption pending completion. For additional information please contact Josh Strange of the YTFP at <strange@u.washington.edu> or the YTFP offices at (530) 625-4139.

Water Quality

Klamath River Basin Water Quality Monitoring

-Contributed by Paul Zedonis, USFWS

Water quality investigations in the Klamath and Trinity River Basins conducted by Arcata Fish and Wildlife Office (AFWO) staff in 2004 are currently being documented in reports. The large quantity of data that was collected during this past field season requires considerable amount of time to process and generate reports. Because these reports have not been generated, the data is currently not available.

Various physical and chemical aspects of water quality were monitored at 13 sites in the Trinity River Basin and 33 locations in the Klamath River Basin. In cooperation with the Yurok and Karuk Tribes, water quality investigations in the Klamath River Basin included: 1) use of multi-probe sondes to collect continuous data on dissolved oxygen, pH, specific conductance, and water temperature at nine mainstem sites and the mouths of the Shasta, Scott, Salmon and Trinity Rivers from June through September/October; 2) collection of water temperature data at several other sites within the Basin from April through October; and 3) collection of monthly water samples for evaluation of nutrient and chlorophyll-a concentrations at these same mainstem and tributary locations from June through September/October. The AFWO will present complete study results in a report titled Dissolved oxygen, specific conductance, water temperature and pH of the Klamath River from Iron Gate Reservoir to the Pacific Ocean from June through October, 2004 by Randy Turner, Jeremy Mull, and Paul Zedonis, which is expected to be completed by May of 2005. For additional information please contact Paul Zedonis of the USFWS, (707) 822-7201, <paul.zedonis@fws.gov>.

The Arcata Office of the USFWS also deployed and retrieved calibrated temperature probes along the Trinity River mainstem and at mouths of select tributaries within the Trinity Basin, with support from the Trinity River Restoration Program. These data, in combination with some water temperature data from the Klamath River below the Trinity River confluence were collected for

the purpose of assessing the effects of Lewiston Dam releases on the water temperatures of the Trinity River and the Klamath River below Weitchpec. A report by Paul Zedonis of the USFWS titled Lewiston Dam releases and their influence on water temperatures of the Trinity and Klamath Rivers, California is expected to be completed in the summer of 2005 and made available electronically at http://arcata.fws.gov. For additional information please contact Paul Zedonis of the USFWS, (707) 822-7201, <paul.zedonis@fws.gov>.

Lower-Klamath and Lower Trinity Water Quality Monitoring

-Contributed by Monica Hiner, YTEP

In 1998, Yurok Tribal Environmental Program (YTEP) was created to protect and restore tribal natural resources through high quality scientific practices. YTEP is dedicated to improving and protecting the natural and cultural resources of the Yurok Tribe through collaboration and cooperation with local, private, state, tribal, and federal entities such as the Yurok Tribe Fisheries Program, USFWS, U.S. Environmental Protection Agency (USEPA), Green Diamond Resource Company, NCRWQCB, and USGS. YTEP staff involved in water quality monitoring included Kevin McKernan, Ken Fetcho, Micah Gibson, Jessica Hackman, Monica Hiner, and Seafha Blount.

During 2004, YTEP conducted continuous water quality monitoring using YSI and Hydrolab datasondes at the following locations: Mainstem Klamath near Turwar Gage (RM 6), above Blue Creek (RM 16), near Tully Creek (RM 39), at Weitchpec above the Trinity Confluence (RM 44), and the mainstem Trinity River upstream of the Klamath Confluence. Datasondes were deployed between 5/18/2004 – 10/20/2004 and programmed to measure temperature, dissolved oxygen, pH, and conductivity at 30-minute intervals. Monthly nutrient grab samples were also collected at these sites during June, July, August, and September and analyzed for alkalinity, calcium, chlorophyll-a, pheophytin, magnesium, TSS, TDS, TOC, nitrate, nitrite, total kjeldahl nitrogen, ammonia nitrogen, total phosphate phosphorus, ortho-P, *Escherichia coli, Streptococcus faecalis,* and total coliform. In coordination with NCRWQCB, YTEP also conducted continuous monitoring in the Klamath River estuary for one week out of the month for June, July, August(two weeks in August) and September using datasondes programmed to measure temperature, salinity, dissolved oxygen, conductivity, and pH at 15-minute intervals. Nutrient grab samples were also collected during June, July, August, and September and analyzed for BOD, chlorophyll-a, pheophytin, TSS, TOC, nitrate, nitrite, total kjeldahl nitrogen, ammonia nitrogen, total phosphate phosphorus, ortho-P. YTEP also collects *Escherichia coli, Streptococcus faecalis*, and total coliform in three locations in the Klamath Estuary on a monthly basis.

YTEP is currently analyzing data and compiling a final report that will include the above data, in addition to data collected from various tributaries to the Klamath River, which should be available by June 2005. For more information, please contact Monica Hiner at (707) 482-1350 ext. 368 or <mhiner@yuroktribe.nsn.us>. Interested parties can also request year-end reports for 2003 and 2002.

Mid-Klamath Temperature Monitoring

-Contributed by LeRoy Cyr, USFS

The USFS in Orleans and Happy Camp began a stream temperature monitoring program in 1996 using continuous stream temperature monitors. Thirty-four monitoring sites are currently in operation from May through October between the confluence of Oak Flat Creek downstream to the Trinity River. Thirteen sites are along the Klamath River mainstem between RM 99.4 and RM 43.05 and are found above and below major tributaries along this continuum. The other twenty-one sites are located in various tributaries and subBasins to the Klamath River.

During this monitoring period, stream temperatures in the lower to mid-Klamath were found to be as high as 80° F during late July 2004. Results from USFS data and other studies along the Klamath River have shown that once water temperatures become warm along the Klamath they typically remain warm, except for stream reaches gaining significant groundwater inflow.

Based on USFS data since 1997, stream temperatures directly below the Salmon River, at RM 65.25 of the Klamath, typically decreased as a result of the influence of the Salmon River. For example, stream temperature data at this site was 1.0 to 3.0°F lower than the Klamath River, at RM 66.25 at various times between May 28th and August 1st of 2004. The additive nature of cold water from the Salmon River and other tributaries within the Klamath River can play an important role in reducing thermal stress and mortality of fish, especially between June and September.

Cool water flowing into the Klamath mainstem from tributaries such as Aikens, Bluff, Slate, Red Cap, Boise, Camp, Pearch, Rock, Dillon, Swillup, Clear, Elk, Thompson and Grider Creeks are vitally important and were monitored by the USFS during the 2004 season. Diel variations were cyclic with a typical mid-afternoon high and an early morning low ranging up to 9° F in some tributaries. Other years of stream temperature monitoring since 1996 have shown similar patterns during the same sampling period.

During late July 2004, many of these tributaries ranged between 62° F to 72° F, significantly less than the Klamath mainstem temperatures recorded at that time. Cool water from smaller tributaries may be equally as important as larger tributaries in maintaining water quality in the Klamath as well as providing thermal refugia for fish.

If you have any questions concerning these temperature monitoring sites or stream flow measurements taken on the Six Rivers or Klamath National Forest, please contact LeRoy Cyr at the Orleans Ranger District, <lcyr@fs.fed.us>, (530) 627-3291 or Jon Grunbaum at the Happy Camp Ranger District, <jgrunbaum@fs.fed.us>, (530) 493-1719.

Quartz Valley Indian Reservation Water Quality Monitoring

-Contributed by Rebekah Sluss, QVIR

The Quartz Valley Indian Reservation EPA (QVIR EPA), with assistance from ECORP Consulting, began a baseline water assessment study to identify water quality issues for the Reservation in October 2004. This study is continuing through 2005. Surface water is being analyzed for: metals, nitrate, nitrite, organophosphate pesticides, TDS, DO, conductivity, pH, and temperature. Groundwater is being analyzed for: total coliform/e coli, chlorite, chloramines, chlorine dioxide, metals, TDS, DO, conductivity, pH, and temperature. In 2005, ECORP will also conduct a stream conditions inventory of the Reservation's section of Shackleford Creek. The Stream Conditions Inventory and the Baseline Water Assessment report will be available in January 2006. Please contact Rebekah Sluss, Quartz Valley EPA Director at (530) 468-5907 or <rebekahqvir@yahoo.com> for more information.

Water Quantity

Klamath River Hydrology

-Contributed by Jim Simondet, NOAA Fisheries

Minimum flows at Iron Gate Dam (IGD) are set annually between April 1 and March 31 of each year based upon current and expected hydrologic conditions, and consistent with the biological

opinions issued by the USFWS (Service) and NOAA Fisheries on the USBOR's Klamath Project. On April 1, 2004, the Natural Resource Conservation Service (NRCS) hydrologic forecast indicated the April through September forecasted inflow into Upper Klamath Lake was consistent with a below average water year type as described in the USBOR's 2002 Biological Assessment (BA) to NOAA Fisheries on Klamath Project Operations (USBOR 2002). Therefore, minimum flows at IGD were set for this below average water year designation (Table 4).

Additional water was released at IGD to meet the biological needs of listed threatened coho salmon (*Oncorhynchus kisutch*) as required in NOAA Fisheries 2002 Biological Opinion on Klamath Project Operations. This additional water, termed the Water Bank, consisted of 75,000 additional acre-feet of water and contributed to increased flow from April 1 through September 30, 2004.

Table 4: Flows at IGD for a Below Average Water Year type

Date	Flow(CFS)	Date	Flow (CFS)
April 1-15	1826	August 16-31	979
April 16-30	1431	September	1168
May 1-15	1021	October	1345
May 16-31	1043	November	1324
June 1 - 7	959	December	1621
June 8 - 15	959	January	1334
June 16 - 23	746	February	1806
June 24 - 30	746	March 1 - 7	2190
July 1-15	736	March 8 - 16	2190
July 16-31	724	March 17 - 24	1896
August 1-15	979	March 25 - 31	1896

On May 1, 2004, NRCS released an updated hydrologic forecast indicating the expected inflow into Upper Klamath Lake had decreased significantly to the point that the new expected volume of water was consistent with a dry water year type. On May 7, 2004, the USBOR began implementing an adjusted minimum flow schedule for a dry water year type described in their 2002 BA (Table 5).

Table 5: Flows at IGD for a Dry Water Year type

Date	Flow(CFS)	Date	Flow (CFS)
April 1-15	822	August 16-31	560
April 16-30	739	September	731
May 1-15	676	October	907
May 16-31	731	November	899
June 1 - 7	641	December	916
June 8 - 15	641	January	1030
June 16 - 23	617	February	673
June 24 - 30	617	March 1 - 7	688
July 1-15	516	March 8 - 16	688
July 16-31	515	March 17 - 24	695
August 1-15	560	March 25 - 31	695

Given the change in water year type and resultant decrease in minimum flows, NOAA Fisheries and the USBOR revised the distribution of the remaining 75,000 acre-foot Water Bank. Additional flows were released at IGD to meet tribal trust needs in late August. Flows also increased to 1300 CFS on August 26, 2004, to allow for a Yurok Tribal boat dance ceremony in Weitchpec, California.

Real-time flow data are collected at gauge stations run by the USGS at four locations in the Klamath River. Gauges are located on the Klamath River at Iron Gate Dam, Klamath River near Seiad Valley, Klamath River at Orleans, and Klamath River near Klamath. Data from 2004 at these gauges reflects the dynamic flow conditions in the Klamath River and can be viewed online at <http://nwis.waterdata.usgs.gov/ca/nwis/sw>.

Trinity River Hydrology

-Contributed by Jim Simondet, NOAA Fisheries

To avert the risk of an adult salmon kill similar to the 2002 fish kill event, the Trinity Management Council (Council) asked the USBOR to proactively release 36,300 acre-feet of water in addition to the proposed flow schedule, beginning in the late summer of 2004. Flows at Lewiston were increased from 450 CFS to 1650 CFS on August 26, 2004. A stair-step reduction in flows was implemented through September 14, 2004.

Flow data are collected at gauge stations run by the USGS at three sites in the Trinity River. Real-time flow data in the Trinity River are collected at the Trinity River at Lewiston (Lewiston), Trinity River near Burnt Ranch (Burnt Ranch), and Trinity River at Hoopa (Hoopa). Flow information for 2004 from these gauge stations can be viewed online at <http://nwis.waterdata.usgs.gov/ca/nwis/sw>.

IV. Resource Needs

As stated earlier in this report, the large network of juvenile traps operated in the spring 2004 alerted KFHAT members to the severity of disease conditions, which may have gone largely undetected if this unprecedented array of traps had not been operated. This reflects the importance of expanding, or at least maintaining, various data collection efforts in the Klamath Basin, which may capture information that otherwise would be missed. Policy-makers rely on accurate, timely, and complete data to make defensible, protective, and fair decisions about resource management in the Klamath Basin.

Funding for most data collection and monitoring projects in the Klamath Basin is allocated on an annual basis. Therefore, the quantity of information from which assessments of stream and fisheries conditions can be made, varies from year to year. Recent state and federal budget cuts have meant that less monitoring was performed this year than in past years, resulting in less information available to assess conditions or trends in the watershed. It appears that budget cuts to various agencies and programs will affect data collection efforts in the Klamath Basin in 2005 and possibly beyond. The following are a few examples of how monitoring by agencies and tribes participating in KFHAT was affected due to funding constraints in 2004:

-Red Cap Creek outmigrant trap was not operated
-Sports creel surveys for the area above Weitchpec (RM 43) to Iron Gate Dam (RM 190) did not occur, and therefore values had to be estimated
-Outmigration for the area from Big Bar (RM 51) to the Estuary (RM 0) was not monitored.
-Reduced coverage and ability to accomplish spawner surveys on the mainstem Klamath and tributaries.

Additionally, in 2006 funding from the Klamath Act (Public Law 99-552), which appropriated $21,000,000 to the Klamath River Basin Conservation Area Restoration Program to restore the anadromous fish of the Klamath River Basin, is scheduled to sunset. This funding resource may

not be available in the future, and will limit data collection in the Klamath Basin. It is important that federal and state funding for the Klamath Basin be made a priority in order have the resources to collect sufficient information about river conditions to predict, avert, and respond quickly to a fish kill and to support development of a fully functioning river system.

At this stage KFHAT does not have any dedicated funding to ensure the group will continue to function as an early warning and coordinated response network. This lack of funding for KFHAT, at times, has meant limited participation by various tribes and agencies that have other responsibilities. The lack of dedicated federal and state funding for KFHAT may eventually eliminate participation by agency personnel thereby making it challenging for KFHAT to continue.

Averting a fish kill is more cost-effective than responding to a fish kill. Preparing for and coordinating the response to a fish kill is more cost-effective and protective than having an unprepared, uncoordinated response. Lack of coordination, lack of the ability to avert or moderate a fish kill, and decision-making in the absence of current defensible data is the most costly of all.

In the near future, KFHAT will continue to provide an early warning and a coordinated response effort to avoid, or at least respond to, possible fish kills with the information that is available in the Basin. However, more predictable ongoing funding sources are needed to support this crucial effort.

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